



ADMINISTRATIVE REPORT

Report Date: October 29, 2010  
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VanRIMS No.: 08-2000-20  
Meeting Date: January 20, 2011

TO: Standing Committee on Planning and Environment  
FROM: Director, Licenses & Inspections  
SUBJECT: Update on the City's Efforts and Impact on Noise Control and Amendments to the Noise Control and Ticket Offences By-laws

**RECOMMENDATION**

- A. THAT Council approve amendments to the Noise Control By-law, No. 6555 substantially as shown in Appendix A to:
  - i) Streamline the approval process for Noise Exemptions by authorizing the Director of Licenses and Inspections to approve applications,
  - ii) Increase the application fee for a Noise Exemption from \$75 to \$148 for applications submitted at least five working days prior to the date of the proposed activity and \$296 for applications submitted less than five working days prior to the date of the proposed activity in order to streamline and recover costs including overtime for processing late applications.
  - iii) Other general amendments to improve effectiveness of the By-law by adding definitions, clarification for holidays, setting a maximum 60-day time restrictions for approved noise exemptions, and correct conflicts.
- B. THAT Council approve amendments to the Ticket Offences By-law, No. 9360 to include offences and related fines for power equipment, leaf blowers, and construction noise substantially as shown in Appendix B.
- C. THAT Council direct Staff to continue to encourage alternatives to traditional back-up alarms for vehicles in order to reduce noise impacts.
- D. THAT Council instruct the Director of Legal Services to prepare and bring forward the necessary changes to the Noise Control By-law, No. 6555 and Ticket Offences By-law, No. 9360 as generally described in Appendices A and B.

### **GENERAL MANAGER'S COMMENTS**

The General Manager RECOMMENDS approval of the above noted recommendations.

### **COUNCIL POLICY**

In May, 1997 City Council endorsed the following recommendations in the Urban Noise Task Force (UNTF) report related to backup signals on vehicles:

*The City should request that the Workers Compensation Board (now known as WorkSafe BC) set and monitor standards for backup signals, ensuring the lowest level of noise consistent with safety.*

*The City should explore alternate methods of ensuring safety with regard to backing vehicles.*

In 2008, City Council approved the transition of services related to the administration and enforcement of the Noise Control By-law from Vancouver Coastal Health (VCH) to the Licenses and Inspections Department effective April 1, 2008.

### **SUMMARY & PURPOSE**

As a result of the City taking over the administration of the Noise Control By-law from Vancouver Coastal Health (VCH) on April 1, 2008, this report:

- A. Provides a general update on the City's efforts and impact with respect to the administration of the Noise Control By-law,
- B. Proposes amendments to the Noise Control By-law aimed at streamlining the Noise Exemption approval process including authorizing the Director of Licences and Inspections to approve applications as well as recommends an increase to the fee for Noise Exemption applications.
- C. Proposes amendments to the Ticket Offences By-law to include offences and related fines for power equipment, leaf blowers, and construction noise, which are currently not covered by the By-law.
- D. Discusses Staff efforts to encourage wider use of back up alarms on vehicles, which are less of a nuisance to the community - broadband type alarms.

### **BACKGROUND**

It is well recognized by the World Health Organization (WHO) that noise impacts people in many ways and noise is a growing health and environmental concern in many urban communities. With the increased densification of our City, noise is a serious concern. There is strong medical evidence that repeated and prolonged exposure to noise is detrimental to health and may cause hearing impairment, increase in stress and blood pressure levels, sleeplessness, headaches, annoyance, and other physiological effects.

In March 1996, a group of citizens was brought together by City Council to form the Urban Noise Task Force (UNTF) to address growing concerns regarding the adverse effects of noise on everyday life in the City of Vancouver. One of the recommendations of this report, endorsed

by Council, was to explore alternatives to the traditional back-up type alarms used on vehicles.

As noted in the Council Policy section of this report, Council approved the termination of the Environmental Health Services (EHS) agreement between the City of Vancouver and VCH in September 2007. The EHS agreement was a contract between the City and VCH whereby VCH was responsible for the administration and enforcement of the City's Health and Noise Control by-laws. This direction resulted in the Licenses and Inspections Department taking over responsibility for the administration of the Noise Control By-law on April 1, 2008.

## ***DISCUSSION***

### ***A. General Update on City's Efforts to Administer the Noise Control By-law and the Impact on Noise Control***

Since taking over the administration of Health and Noise Control By-laws from VCH on April 1, 2008, the Licenses and Inspection Department identified a number of key issues that required addressing to support the department's administration of these by-laws. These key issues and the Department's response to the key issues are summarized in Table 1.

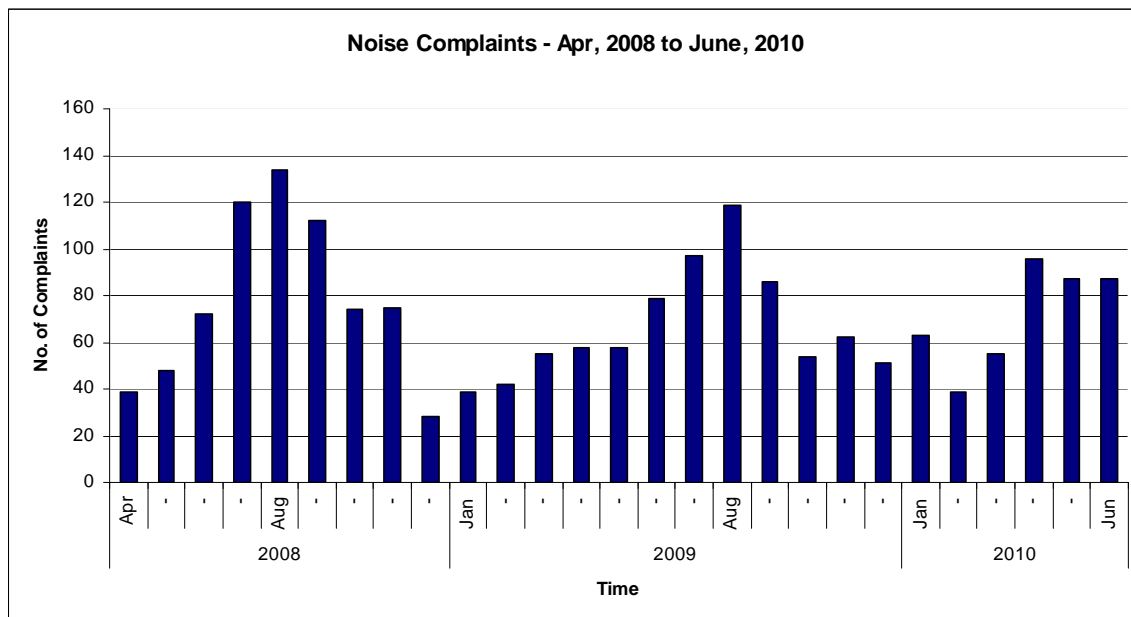
*Table 1 - Key Issues and Responses to Support the Implementation of the Licenses & Inspections Department's Administration of the Health and Noise Control By-laws*

<b>Key Issue</b>	<b>Departmental Response to Support Key Issue</b>
Noise Control Training	<ul style="list-style-type: none"> <li>An in-house training and certification program in community noise enforcement was developed and delivered to 29 Property Use Inspectors by Rutgers University, New Jersey.</li> <li>A Staff Team (5 Inspectors/Managers) visited Seattle to investigate and learn about the City of Seattle's approach to noise control. Staff are currently looking to ways to include some of this learning in Vancouver.</li> <li>2 staff members attended a noise control seminar in Kirkland, USA in order to expand the team's knowledge on noise control issues.</li> </ul>
Staffing Resources	<ul style="list-style-type: none"> <li>Council approved 3 full time Property Use Inspector positions, 1 full time Policy Analyst position and 1 full time Clerical position to address the administration of the Health and Noise Control by-laws. These positions were filled shortly after April 2008.</li> </ul>
Data and Tracking of Noise Issues	<ul style="list-style-type: none"> <li>Staff developed a computerized database to record the types of noise complaints and measure related enforcement impacts.</li> <li>Staff set up a dedicated Noise Hot Line and an email account for the public to submit noise complaints. (These systems allow the tracking of noise concerns.)</li> </ul>
Community Awareness	<ul style="list-style-type: none"> <li>Staff developed an information webpage and brochures to raise the public's awareness of noise control issues.</li> </ul>
Noise Mitigation Strategies	<ul style="list-style-type: none"> <li>Staff team worked with Engineering to encourage the installation of broadband type back up alarms on City owned fleet vehicles to reduce noise impacts.</li> <li>Where possible Staff encourage the installation of broadband type back up alarms for vehicles on construction sites that submit a Noise Exception application.</li> </ul>

Figure 1 illustrates the number of noise complaints received by the department on a monthly basis since taking over the administration of the Noise Control By-law. As illustrated in Figure 1, the number of complaints received has not changed significantly, however the overall number of complaints for the 2009 and 2010 summer months has decreased slightly when

compared to 2008. As expected, noise complaints typically increase during the summer months - June to September. Staff believe that increased outdoor activities, open windows and construction during summer months is a significant contributing factor to this pattern. It is interesting to note that even with the 2010 Winter Games, the number of noise complaints in February and March 2010 were about the same as that of the same period in 2009. Staff believe that their work with operators throughout the games helped to control the number of noise concerns. It is evident from Figure 1 that the pattern for noise complaints remains consistent. It is also evident from this graph that Staff are having some impact on reducing the overall number of noise complaints.

*Figure 1 - Number of Noise Complaints by Month and Year from April 2008 to June 2010*



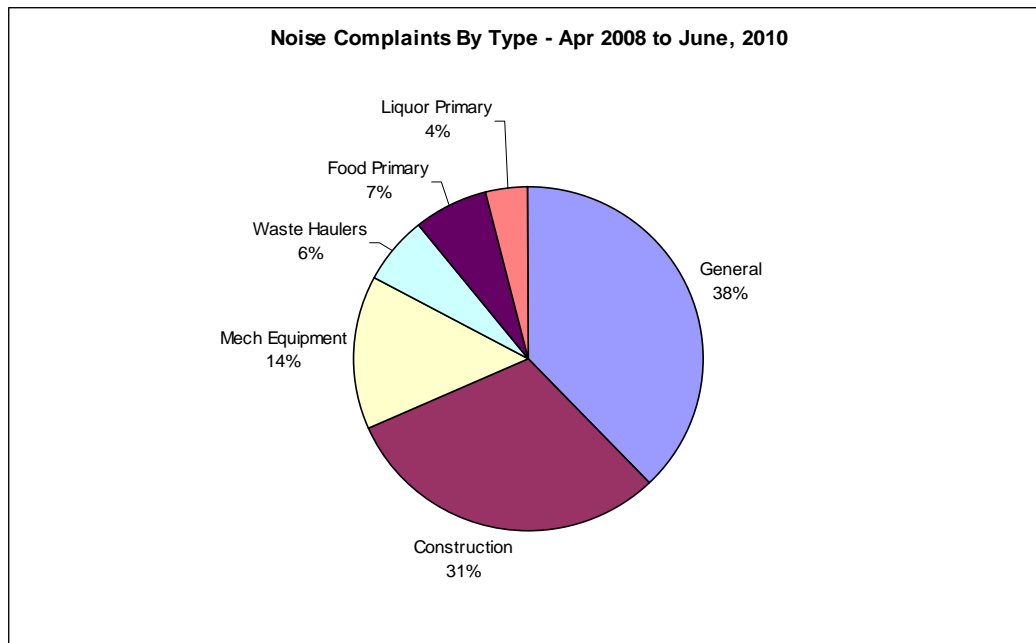
Staff have developed a comprehensive data base for tracking the number of noise complaints based on the category of noise issue. To accomplish this, noise issues are categorized as follows:

- Construction Noise - noise exceeding by-law limits and/or outside allowable hours
- Food Primary Noise - nuisance type noise resulting from activity associated with restaurants (music and patron behaviour)
- Liquor Primary Noise - nuisance type noise resulting from establishments having a liquor primary license such as bars, nightclubs and pubs (music and patron behaviour)
- Mechanical Equipment Noise - noise resulting from the operation of furnaces, boilers, air conditioning units and heat pumps
- Waste Hauler Collection - noise resulting from the operation vehicles used to collect waste after allowable hours.
- General Noise - resulting from house parties, delivery trucks, leaf blowers etc.

Figure 2 illustrates the number of noise complaints by category since the Department took over the administration of the Noise Control By-law. Overall the greatest number of complaints received by the Department relate to general noise issues and construction noise.

Since April 2008, staff enforcement efforts have consistently resulted in a high level of compliance for all of the above noted noise issues. Since the department took over the administration of the Noise Control By-law, the rate of compliance for completed noise complaints has ranged from 93 to 100 percent depending on the specific category of noise. Generally speaking, the number of noise complaints by category has not changed greatly since the department began administering the Noise Control By-law. However, through the development of a good working relationship with operators, Staff had a significant impact on the number of noise complaints related to waste haulers and construction sites.

*Figure 2 - Number of Noise Complaints by Category (April 2008 to June 2010)*



Waste hauler companies have responded positively to City Staff by actively managing their drivers in regards to the hours of waste collection. One waste hauler company installed a GPS (Global Positioning System) on company vehicles to assist with noise investigations and ensure that their drivers are compliant with City by-laws. Over the past six months, the number of waste hauler complaints have decreased by approximately 50 percent.

With respect to construction noise, Staff initially focused their efforts on larger construction companies. Through ongoing discussions with the construction industry and encouraging them to implement better noise control measures on their sites to mitigate noise issues, while at the same time granting noise exemptions, the number of complaints related to larger construction companies has decreased over the last year. In many cases, construction project managers have scheduled work having less noise impacts during the more sensitive hours and at the same time provided effective controls to manage workers. Other project managers have taken a more pro-active approach by speaking directly with their neighbours about noise concerns before construction activity. With a decline in major construction in the City, Staff are now noticing a shift in construction related noise issues to the smaller companies carrying out repair and renovation type work as well as construction related to one and two family dwellings. As a result, Staff are focusing their efforts to assist smaller construction sites with

by-law compliance by educating this industry as well as homeowners about noise control issues.

Staff carried out a sampling of construction related noise complaints for the entire area west of Cambie Street including the downtown peninsula for 2009 and January 1, 2010 to July 31, 2010. The results of this sampling (See Table 2) confirm that staff's efforts have had a significant impact on construction related noise complaints from larger construction type projects. Table 2 indicates that while the number of monthly complaints for construction noise rose in 2010 when compared to 2009, the majority of the complaints (81%) were related to smaller construction projects.

*Table 2 - Comparison of Construction Related Noise Complaints for Smaller and Larger Type Projects for 2009 and 2010*

Year	Number of Complaints	Large Construction Projects	Small Construction Projects
2009	18.8 per month	41%	59%
2010	23.2 per month	19%	81%

#### *B. Amendments to Noise Control By-law (See Appendix A)*

Because of the Vancouver Charter provisions that were in place at the time that the Noise Control By-law was enacted, all noise exemptions outside allowable hours had to be approved by the Mayor. In the latter part of 2009, the City obtained an amendment to the Vancouver Charter which allowed the By-law to be amended such that the Director of Licenses and Inspections could have the authority to approve these exemptions rather than the Mayor. Therefore, should Council accept the recommendations contained in this report; the Director of Licenses and Inspections will be authorized to approve Noise Exemption applications.

While reviewing the Noise Control By-law, Staff identified that the current application fee of \$75 for a Noise Exemption did not allow the City to adequately recover processing costs for these types of applications. The current fee of \$75 was established by VCH in 2003 and had not been adjusted since then. On average, a typical application requires approximately one hour of staff time which includes the following Staff activities: file research, application review and field review (when needed). Existing comparable fees for activities such as these is \$148 when based on one hour of Staff time.

In addition, Staff noted that it is not uncommon for applicants to submit applications for a Noise Exemption very close to the date for the proposed activity and thereby providing Staff with insufficient time to process the application. As a result, staffing resources need to be re-allocated and overtime assigned to address the processing of these late applications. Therefore, in order to recover these costs and hopefully encourage applicants to submit applications in a timely manner, Staff recommends that the application fee be increased to \$296 when the application is received less than five days prior to the proposed activity.

Therefore, should Council accept the recommendations contained in this report, the application fee for a Noise Exemption will be increased to \$148 where the application is submitted at least five working days prior to the proposed activity and \$296 where the application is submitted less than five working days prior to the proposed activity.

Furthermore, it should be noted that Staff reviewed these fees across the Lower Mainland as well as other major cities in Canada and found no consistency between these cities (i.e. fees range from \$ 0 to \$100).

There are a number of other minor housekeeping amendments proposed for the Noise Control By-law. These minor amendments include adding definitions, clarification with respect to holidays, definitions for sound measurements, restricting time period for an exemption to 60 days to allow for sufficient monitoring of site activity, and correcting minor conflicts with the By-law.

#### *C. Minor Amendments to the Ticket Offences By-law (See Appendix B)*

Currently there are more noise offences and related fines established in the Noise Control By-law than the Ticket Offences By-law. In order to ensure more effective and consistent enforcement action, Staff recommend that the noise offences and related fines under the Ticket Offences By-law be expanded to include additional offences that are in the Noise Control By-law. These additional offences include those concerning power equipment, leaf blowers and construction noise. Should Council accept the recommendations in this report, inspectors and police will have the ability to take enforcement either by ticket information or long form information. This recommendation does not raise the current fines in the Ticket Offences By-law.

#### *D. Staff Efforts to Encourage Use of Broadband Backup Alarms on Vehicles*

As noted in the Council Policy section of this report, Council directed staff to explore alternatives to the traditional back up alarms used on vehicles. Complaints related to traditional back-up alarms on vehicles are a common complaint received by the Licenses and Inspections Department. While these alarms serve as an effective safety device to warn people of potential dangers when a vehicle is backing up, the noise associated with these devices is often a nuisance for the neighbourhood.

Broadband type back-up alarms provide an effective solution to noise complaints while at the same time providing sufficient safety. This type of technology is accepted by WorkSafe BC as meeting the applicable Occupational Health and Safety Regulations and automotive engineering standards. Cities such as Seattle and New York have incorporated the required use of broadband type back-up alarms in some form within their noise regulations; while other government agencies and private organizations have adopted and recommended broadband type alarms for their day to day business. Additional information related to broadband type back up alarms is provided in Appendix C of this report.

Based on a community survey where staff successfully encouraged a business operator to install this type of technology on their fleet vehicles earlier in the year, respondents noted that the broadband alarms were less intrusive and annoying and a definite improvement.

In order to encourage broader use of broadband technology for vehicles and reduce noise complaints, Staff have carried out the following actions:

- Engineering Services have installed this technology on 18 recycling trucks over the past year,

- Inspectors have successfully encouraged a business to replace their traditional back-up alarms with broadband type back-up alarms. This action successfully eliminated complaints from neighbours.
- Staff routinely encourage the use of broadband type back-up alarms for construction sites where noise complaints are received.

Staff will continue to explore ways to increase the use of broadband type back-up alarms on vehicles. In addition, Staff will take steps to educate the public, including business operators of broadband type back-up alarms through our websites along with partnerships with other organizations such as WorkSafe BC.

### ***FINANCIAL IMPLICATIONS***

Recommendation A (i) and A (iii) have no financial implications.

Staff indicate that there are financial implications for Recommendation A(ii) and estimate that the increased Noise Exception Approval fee proposed in this report will generate approximately \$26,200 in revenue for 2011 (an increase of \$18,200 as compared to 2010). This is based on the number of applications for 2009 at the proposed regular fee of \$148 per application. Therefore, the actual revenue for 2011 may vary depending on the number of applications received for the year.

It is difficult to estimate the financial implications of Recommendation B as the enforcement intention is to gain compliance without issuing tickets resulting in fines. However, Staff believe that Recommendation B will provide an effective enforcement tool for inspectors to issue tickets for the additional noise offences at a minimum fine of \$250, with the exception of construction noise and refuse collection noise outside permitted time at a minimum fine of \$500.

### ***ENVIRONMENTAL IMPLICATIONS***

The UNTF report states that noise is an environmental issue contributing to 'noise pollution'. Therefore, the implementation of our Noise Control Program including the use of broadband type back-up alarms will help to reduce noise pollution and contribute to a more liveable environment for people who work, live and visit the city.

### ***SOCIAL IMPLICATIONS***

The effects of noise on health are recognized by the WHO and a reduction in overall noise levels has been shown to have a beneficial effect on the health of individuals and the well-being of society.

### ***CONCLUSION***

While the number of noise complaints has not significantly decreased since the City took over the administration of the Noise Control By-law from Vancouver Coastal Health, the City has had a positive impact controlling noise concerns since April 2008. Through good working relationships with the waste hauler industry, the number of waste hauler type noise



complaints has reduced by approximately 50%. Staff have been successful in reducing construction related noise complaints by working closely with the larger construction companies and wherever possible encouraging the use of broadband type back up alarms for these sites. Staff will now focus their efforts with smaller construction companies responsible for smaller type projects and one and two family home owners.

Broadband type back-up alarms installed on vehicles is an effective and safe method of controlling noise concerns when compared to traditional back-up alarms. Staff have successfully encouraged the use of this type of technology on some city vehicles and sites where the use of traditional back-up alarms caused increased noise complaints. Staff will continue to encourage this type of technology wherever possible.

This report also recommends a number of amendments to the Noise Control and Ticket Offences By-law aimed at improving the overall effectiveness of the City's administration of the Noise Control Program.

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BY-LAW NO. \_\_\_\_\_

**A By-law to amend Noise Control By-law No. 6555  
regarding noise exceptions and housekeeping matters**

THE COUNCIL OF THE CITY OF VANCOUVER, in public meeting, enacts as follows:

1. This By-law amends the indicated provisions of the Noise Control By-law.
2. To section 2, Council adds:
  - (a) after the definition of "daytime":

' "dBA" means the sound pressure level in decibels measured using the "A" weighting network setting of an approved sound meter and with slow response;' and
  - (b) after the definition of "extended hours liquor establishment":

' "holiday" includes:

    - (i) Sunday, Christmas Day, Good Friday and Easter Monday;
    - (ii) Canada Day, Victoria Day, British Columbia Day, Labour Day, Remembrance Day and New Year's Day;
    - (iii) December 26; and
    - (iv) a day fixed by the Parliament of Canada or by the Legislature, or appointed by proclamation of the Governor General or the Lieutenant Governor, to be observed as a day of general prayer or mourning, a day of public rejoicing or thanksgiving, a day for celebrating the birthday of the reigning Sovereign, or as a public holiday.'
3. In section 17, Council:
  - (a) removes the word "Mayor" wherever it occurs and substitutes: "Director of Permits & Licences" in each case; and
  - (b) at the end of subsection (1), Council deletes "." and adds: "except that an exception must not be granted for a period longer than sixty days."
4. In section 20, Council repeals section 20(5).
5. In Schedule A, at page v, Council removes the words "1120 West Georiga Street" and substitutes: "1120 West Georgia Street".
6. In Schedule B, Council removes "CFC-1" and substitutes: "FC-1".



BY-LAW NO. \_\_\_\_\_

**A By-law to amend Ticket Offences By-law No. 9360  
regarding housekeeping matters**

THE COUNCIL OF THE CITY OF VANCOUVER, in public meeting, enacts as follows:

1. This by-law amends the indicated provisions of Ticket Offences By-law No.9360.
2. Council strikes out Table 4 in the Ticket Offences By-law, and substitutes the following:

<u>Column 1</u>	<u>Column 2</u>	<u>Column 3</u>	<u>Column 4</u>
Chief License Inspector  Police Officer	Objectionable noise	Section 4	\$250.00
	Operating power equipment at sound level over 77 dBA	Section 14	\$250.00
	Operating power equipment during night time	Section 14 (a)	\$250.00
	Operating leaf blower in prohibited area	Section 14B (a)	\$250.00
	Operating leaf blower outside permitted hours	Section 14B (b)	\$250.00
	Operating leaf blower without manufacturer's decal	Section 14B (c)	\$250.00
	Construction noise at sound level over 85 dBA on or adjacent to residential premises	Section 15	\$250.00
	Construction noise disturbing public outside permitted time	Section 16	\$500.00
	Refuse collection noise outside of permitted time	Section 19	\$500.00

3. This By-law is to come into force and take effect on the date of its enactment.



Additional Information on Broadband Type Back-up Alarms	
Topic	Details
Reason	<ul style="list-style-type: none"> <li>It has been shown that noise exposure causes health impacts on humans such as elevated blood pressure, stress, quantity &amp; quality of sleep, extreme emotions and behaviour.</li> <li>Staff anticipates the broadband alarm will help reduce urban noise levels and noise complaints.</li> </ul>
Safety Requirement	<ul style="list-style-type: none"> <li>OHS Regulation 16.8 Warning signal device Mobile equipment in which the operator cannot directly or by mirror or other effective device see immediately behind the machine must have an automatic audible warning device which (a) activates whenever the equipment controls are positioned to move the equipment in reverse, and (b) if practicable, is audible above the ambient noise level.</li> </ul>
Broadband Sound	<ul style="list-style-type: none"> <li>Multi-frequency band (broadband) instead of a single frequency (pure tone).</li> <li>Sound is different and uncommon (shh,shh) instead of the traditional sound (beep)</li> <li>Broadband sound is locatable and directional (Frequencies: low-time; mid-left or right; high-front or back)</li> <li>Broadband sound provides the same loudness at 5dB less than a tonal sound.</li> <li>Broadband sound dissipates quickly.</li> <li>Broadband sound has less sound reflection from structures.</li> </ul>
Product	<ul style="list-style-type: none"> <li>2 Types: Standard and 'Smart' (Self-Adjusting Volume).</li> <li>Various models for different applications.</li> </ul>
Cost	<ul style="list-style-type: none"> <li>Varies depending on type, model and distributor.</li> <li>Approximately \$100 - \$150 retail; \$90 - \$140 fleet for standard types.</li> <li>Approximately \$125 - \$200 retail; \$115 - \$170 fleet for 'smart' types.</li> </ul>
Distributors	<ul style="list-style-type: none"> <li>Various suppliers available in Lower Mainland and United States.</li> </ul>
Award	<ul style="list-style-type: none"> <li>SAE Award in 2004 for 'Noise Management Innovations' <a href="http://www.sae.org/servlets/awardInfo?OBJECT_TYPE=awardInfo&amp;PAGE=getMainPage&amp;awardCode=E2T">http://www.sae.org/servlets/awardInfo?OBJECT_TYPE=awardInfo&amp;PAGE=getMainPage&amp;awardCode=E2T</a></li> </ul>
Utilization	<p>Globally used by private or public companies or stipulated by regulatory bodies:</p> <ul style="list-style-type: none"> <li>United States <ul style="list-style-type: none"> <li>Seattle - stipulated condition in Noise Variances</li> <li>New York - Noise Regulation Chapter 28</li> <li>Colorado - Bacon Quarry</li> <li>California - Hanson Aggregates West Region</li> <li>Tennessee - Memphis Stone &amp; Gravel</li> <li>Port of Houston - Zachry Construction</li> <li>Washington, DC - Pentagon Facility management</li> <li>Massachusetts - Noise Specification on ABP</li> <li>Hawaii - Grace Pacific Corporation</li> </ul> </li> <li>Canada <ul style="list-style-type: none"> <li>Ontario - Vineland Quarries and Crushed Stone</li> <li>Vancouver - City of Vancouver, Dunbar Lumber</li> </ul> </li> <li>United Kingdom <ul style="list-style-type: none"> <li>Burlington - Burlington Slate Ltd</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ South Devon - WBB Minerals</li> <li>○ Brentford - Day Group</li> <li>○ England - 2012 Olympics Code of Construction Practice (Olympic Delivery Authority)</li> <li>● Australia <ul style="list-style-type: none"> <li>○ NSW Transport Infrastructure Development Corporation - Rail Projects</li> <li>○ NSW Road Traffic Authority - Oxley Highway, Port Macquarie</li> <li>○ Victoria Middleborough Road Rail Separation</li> <li>○ South Australia Dept. Transport Energy and Infrastructure</li> </ul> </li> </ul>
<p>Safety Acceptance &amp; References</p>	<ul style="list-style-type: none"> <li>● WorkSafe BC (Inspection report Sept. 29, 2009).</li> <li>● Society of Automotive Engineers standards (SAE J994).</li> <li>● Occupational &amp; Safety Hazard Administration, United States (OSHA - Interpretation letter dated Sept. 27, 2004).</li> <li>● Mine Safety and Health Administration (MSHA - Grading and excavating). <a href="http://www.gradingandexcavating.com/july-august-2008/job-site-safety-3.aspx">http://www.gradingandexcavating.com/july-august-2008/job-site-safety-3.aspx</a></li> <li>● Washington State Dept., Labor &amp; Industries, Div. of Occupational Safety and Health (DOSH 122007 Backup Alarm Hazard Alert). - retrieve Mar, 2010 "An alternative to a louder alarm might be a 'smarter' alarm, such as a multi-frequency 'broadband' backup alarm..." <a href="http://www.lni.wa.gov/WISHA/hazalerts/122007BackupAlarmHazardAlert.pdf">http://www.lni.wa.gov/WISHA/hazalerts/122007BackupAlarmHazardAlert.pdf</a></li> <li>● Health &amp; Safety Executive, United Kingdom (Contract Research Report 358/2001 - Improving the safety of workers in the vicinity of mobile plant).-retrieved Mar/10 "It is anticipated that reversing alarms based on broadband noise localisation will have a part to play in both reducing mobile plant accidents, by increasing vehicle localization capability, together with offering reduced audible nuisance." <a href="http://www.hse.gov.uk/research/crr_pdf/2001/crr01358.pdf">http://www.hse.gov.uk/research/crr_pdf/2001/crr01358.pdf</a></li> <li>● (1) (4) Dept. of Environment and Climate Change NSW Government (Review of alternatives to 'beeper' alarms for construction equipment May 8, 2009) "Broadband alarms have been demonstrated to reduce noise complaints from the community due to the character and nature of the sound" <a href="http://www.environment.nsw.gov.au/resources/noise/beeperalarm.pdf">www.environment.nsw.gov.au/resources/noise/beeperalarm.pdf</a> -retrieved Mar, 2010</li> <li>● Occupational Health &amp; Safety Online (The Lowdown on Backup Alarms in Retail Stores by Barrett Miller July 12, 2007). - retrieved Mar. 2010 <a href="http://ohsonline.com/articles/2007/07/the-lowdown-on-backup-alarms-in-retail-stores.aspx">http://ohsonline.com/articles/2007/07/the-lowdown-on-backup-alarms-in-retail-stores.aspx</a></li> <li>● (2) Institute of Acoustics (Acoustics Bulletin May/June 2008 - 'From bell to broadband' by Geoff Leventhall). - retrieved Mar. 2010 "The broadband sound is an effective alarm when close to the vehicle, whilst also sounding more pleasant and less intrusive than a beeping alarm does when at a distance....At the present time, it is too early to say whether broadband sound will be the alarm of the future, but its current rapid acceptance, for both environmental and safety reasons, is a positive indication." <a href="http://www.ioa.org.uk/uploads/publicationdocuments/Acoustics%20Bulletin%20Vol133No3.pdf">http://www.ioa.org.uk/uploads/publicationdocuments/Acoustics%20Bulletin%20Vol133No3.pdf</a></li> <li>● (3) Composite Risk Management for US Army (Seattle District Safety Gram Sept. 15, 2009). - retrieved April, 2010 <a href="http://www.noisepollution.org/resource/construc/safetygram.pdf">http://www.noisepollution.org/resource/construc/safetygram.pdf</a></li> <li>● Broadband range of frequencies is more easily heard by those with hearing loss.</li> <li>● American Council for the Blind called for the use of locatable sound in 2002. <a href="http://www.acb.org/magazine/2002/convention02.html">http://www.acb.org/magazine/2002/convention02.html</a> <a href="http://www.constructionequipmentguide.com/Brigade-Battles-Blaring-Beep-Beep-Beeps-With-White-Wound/11647/">http://www.constructionequipmentguide.com/Brigade-Battles-Blaring-Beep-Beep-Beeps-With-White-Wound/11647/</a></li> </ul>